

## WHAT IS CLAIMED IS:

1. An extruded thermoplastic polyurethane composition having a high crystalline content comprising the reaction product of:

5 a polyol component, wherein said polyol component has a number average molecular weight of about 500 to about 10,000 per polyol;

a polyisocyanate component;

10 a chain extender component, wherein said chain extender component is an unbranched, unsubstituted, straight chain diol, or an aromatic containing diol having substantially trans-trans-isomers, or a combination thereof;

15 a crystallization retarding component, wherein said crystallization retarding component is a diol which is branched, substituted or contains at least one heteroatom, or a combination thereof, wherein if said diol contains an aromatic group there is no trans-trans-isomers; and

optionally, a polyurethane catalyst;

20 wherein said composition has been extruded, and wherein said composition has a hard segment content of at least 20%.

2. A composition according to claim 1, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 1 to about 15 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

3. A composition according to claim 1, wherein said crystallization retarding component is dipropylene glycol, tripropylene glycol, diethylene glycol, triethylene glycol, neopentyl

glycol, 1,3-butane diol, 2-methyl-2,4-pentane diol, or a combination thereof.

4. A composition according to claim 2, wherein said  
5 polyol component comprises hydroxyl terminated polyesters,  
hydroxyl terminated polyethers, hydroxyl terminated  
polycarbonates, hydroxyl terminated polycaprolactams, hydroxyl  
terminated polyolefins, hydroxyl terminated polyacrylates, or a  
combination thereof, and wherein said polyol component is utilized  
10 in an amount so that the hydroxyl group content is generally from  
about 2 to about 70 equivalents per 100 equivalents of the total  
hydroxyl groups present in the composition.

5. A composition according to claim 2, wherein said  
15 polyisocyanate component comprises diphenylmethane-4,4'-  
diisocyanate.

6. A composition according to claim 2, wherein the  
equivalent weight ratio of polyisocyanate functional groups to total  
20 hydroxyl functional groups of the polyol component crystallization  
retarding component and the chain extender component is from  
about 0.90 to about 1.10.

7. A composition according to claim 1, wherein said  
25 composition has a hard segment content of about 30% to about  
90%.

8. A composition according to claim 2, wherein the  
crystallization retarding component is utilized in an amount so that  
30 the hydroxyl group content is from about 2 to about 12 equivalents  
per 100 equivalents of the total hydroxyl groups of the polyol

component, the chain extender component and the crystallization retarding component.

5 9. A composition according to claim 3, wherein said crystallization retarding component is dipropylene glycol.

10 10. A composition according to claim 4, wherein said chain extender component is 1,4'-butanediol, ethylene glycol, 1,6-hexanediol, 1,4'-cyclohexanedimethanol, 1,4'-bis-2-hydroxyethoxy benzene, 1,4'-benzenedimethanol, 1,3'-propanediol, and 1,5'-pentanediol, or combinations thereof.

15 11. A composition according to claim 1, wherein said catalyst is present and comprises stannous octoate, dibutyltin dioctoate, dibutyltin diluarate, bismuth octoate, or a combination thereof.

20 12. A composition according to claim 1, wherein said composition has been extruded into a membrane, breathable film, sheet, tubing, wire, cable jacketing, shoe sole, hose, or a fiber.

25 13. An extruded thermoplastic polyurethane composition having a high crystalline content comprising the reaction product of:  
a polyol component, wherein said polyol component has a number average molecular weight of about 500 to about 10,000 per polyol;

a polyisocyanate component;

30 a chain extender component, wherein said chain extender component is an unsubstituted, straight chain diol, or an aromatic containing diol having substantially trans-trans-isomers, or a combination thereof;

a crystallization retarding component, wherein said crystallization retarding component is a diol which is branched, substituted or contains at least one heteroatom, or a combination thereof, wherein if said diol contains an aromatic group there is no trans-trans-isomers; and

optionally, a polyurethane catalyst;

wherein said composition has been extruded, and wherein said composition has greater than about 4 J/g heat of crystallization exotherm during cool down from melt.

14. A composition according to claim 1, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 1 to about 15 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

15. A composition according to claim 1, wherein said crystallization retarding component is dipropylene glycol, tripropylene glycol, diethylene glycol, triethylene glycol, neopentyl glycol, 1,3-butane diol, 2-methyl-2,4-pentane diol, or a combination thereof.

16. A composition according to claim 2, wherein said polyol component comprises hydroxyl terminated polyesters, hydroxyl terminated polyethers, hydroxyl terminated polycarbonates, hydroxyl terminated polycaprolactams, hydroxyl terminated polyolefins, hydroxyl terminated polyacrylates, or a combination thereof, and wherein said polyol component is utilized in an amount so that the hydroxyl group content is generally from

about 2 to about 70 equivalents per 100 equivalents of the total hydroxyl groups present in the composition.

17. A composition according to claim 2, wherein said  
5 polyisocyanate component comprises diphenylmethane-4,4'-diisocyanate.

18. A composition according to claim 2, wherein the  
10 equivalent weight ratio of polyisocyanate functional groups to total hydroxyl functional groups of the polyol component crystallization retarding component and the chain extender component is from about 0.90 to about 1.10.

19. A composition according to claim 1, wherein said  
15 composition has about 5 to about 40 J/g heat of crystallization exotherm during cool down from melt.

20. A composition according to claim 2, wherein the  
20 crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 3 to about 12 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

21. A composition according to claim 3, wherein said  
25 crystallization retarding component is dipropylene glycol.

22. A composition according to claim 4, wherein said chain  
30 extender component is 1,4'-butanediol, ethylene glycol, 1,6-hexanediol, 1,4'-cyclohexanedimethanol, 1,4'-bis-2-hydroxyethoxy

benzene, 1,4'-benzenedimethanol, 1,3'-propanediol, and 1,5'-pentanediol, or combinations thereof.

23. A composition according to claim 1, wherein said  
5 catalyst is present and comprises stannous octoate, dibutyltin dioctoate, dibutyltin diluarate, bismuth octoate, or a combination thereof.

24. A composition according to claim 1, wherein said  
10 composition has been extruded into a membrane, breathable film, sheet, tubing, wire, cable jacketing, shoe sole, hose, or a fiber.

25. A process for preparing a thermoplastic polyurethane  
having a high crystalline content, comprising the steps of:  
15 extruding in an extruder a thermoplastic polyurethane composition comprising:

a polyol component, wherein said polyol component has a number average molecular weight of about 500 to about 10,000 per polyol;

20 a polyisocyanate component;

a chain extender component, wherein said chain extender component is an unsubstituted, straight chain diol, or an aromatic containing diol having substantially trans-trans-isomers, or a combination thereof;

25 a crystallization retarding component, wherein said crystallization retarding component is a diol which is branched, substituted or contains at least one heteroatom, or a combination thereof, wherein if said diol contains an aromatic group there is no trans-trans-isomers; and

30 optionally, a polyurethane catalyst,  
wherein said composition has been extruded, and wherein said

composition has a hard segment content of at least 20%.

26. A composition according to claim 1, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 1 to about 15 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

27. A composition according to claim 1, wherein said crystallization retarding component is dipropylene glycol, tripropylene glycol, diethylene glycol, triethylene glycol, neopentyl glycol, 1,3-butane diol, 2-methyl-2,4-pentane diol, or a combination thereof.

28. A composition according to claim 2, wherein said polyol component comprises hydroxyl terminated polyesters, hydroxyl terminated polyethers, hydroxyl terminated polycarbonates, hydroxyl terminated polycaprolactams, hydroxyl terminated polyolefins, hydroxyl terminated polyacrylates, or a combination thereof, and wherein said polyol component is utilized in an amount so that the hydroxyl group content is generally from about 2 to about 70 equivalents per 100 equivalents of the total hydroxyl groups present in the composition.

29. A composition according to claim 2, wherein said polyisocyanate component comprises diphenylmethane-4,4'-diisocyanate.

30. A composition according to claim 2, wherein the equivalent weight ratio of polyisocyanate functional groups to total hydroxyl functional groups of the polyol component crystallization

retarding component and the chain extender component is from about 0.90 to about 1.10.

5 31. A composition according to claim 1, wherein said composition has a hard segment content of about 30% to about 90%.

10 32. A composition according to claim 2, wherein the crystallization retarding component is utilized in an amount so that the hydroxyl group content is from about 2 to about 12 equivalents per 100 equivalents of the total hydroxyl groups of the polyol component, the chain extender component and the crystallization retarding component.

15 33. A composition according to claim 3, wherein said crystallization retarding component is dipropylene glycol.

20 34. A composition according to claim 4, wherein said chain extender component is 1,4'-butanediol, ethylene glycol, 1,6-hexanediol, 1,4'-cyclohexanedimethanol, 1,4'-bis-2-hydroxyethoxy benzene, 1,4'-benzenedimethanol, 1,3'-propanediol, and 1,5'-pentanediol, or combinations thereof.

25 35. A composition according to claim 1, wherein said catalyst is present and comprises stannous octoate, dibutyltin dioctoate, dibutyltin diluarate, bismuth octoate, or a combination thereof.

30 36. A composition according to claim 1, wherein said composition has been extruded into a membrane, breathable film, sheet, tubing, wire, cable jacketing, shoe sole, hose, or a fiber.